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(54) HOSE WITH INTEGRAL FLANGED END

(71) We, OLDHAM SEALS LIMITED, a British Company, of Jetpac Works, Quarry Lane, Chichester, Sussex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to hoses having flanged ends, and more particularly to a hose having an integral flanged end (or ends) which is/are built into the hose so as to become an integral part thereof.

Difficulty has been experienced for many years in providing flanged ends on hoses. The practice in the past was to acquire a length of hose and then fit a separate flanged end to it. Numerous flange fittings were available, some of which included a sleeve which was pushed into the end of the hose, and means to clamp the hose on to this sleeve. This produces a reduction in the bore of the hose at the flange and may lead to turbulence and other difficulties when a large volume of fluid is forced through a hose under high pressure. No really satisfactory solution to the problem was found and more recently attempts have been made to produce a form of flange, for use on reinforced hose, which could be "built-in" to the end of the hose, but here again certain disadvantages have arisen where the hose is to be used for operation at very high pressure and is likely to receive very rough treatment as, for example, the large diameter hose known as dockside hose or bunkering hose, which is used for filling the bunkers of ships with oil fuel.

The principal object of the invention is to provide a hose with an integral flanged end which may be made in convenient lengths, for example 30 feet long, so that any number of these lengths may be assembled together by bolting to form a hose of any desired length, the construction being such that a bore of uniform diameter is formed from end to end of the assembled hose.

In one aspect the invention consists of a method of manufacturing a hose having an integral flanged end comprising the steps of providing a mandrel, placing on the mandrel a tube of flexible material to form the basic inner tube of the hose, placing over the end of the basic tube a metal flange having a bore substantially equal to the outer diameter of the basic tube and having an integral perforated metal sleeve projecting from its bore towards the body of the hose, applying over the basic tube and the sleeve a plurality of plies of reinforcing material, applying a single layer helical winding of metal wire over the said plurality of plies, electrically bonding the adjacent end of the wire winding to the flange, applying a further plurality of plies of reinforcing material over the wire winding, applying an outer covering over the further plurality of plies, removing the hose from the mandrel, placing inside the basic tube and flange a lining of flexible material and splaying out the end of the basic tube and lining to overlie a part of the outer face of the flange and form a fluid seal with a connecting member, and bonding the flange, basic tube, plies, wire winding, outer covering and lining to each other.

In a modification of the method defined above flexible material forming the lining is first placed on the mandrel, and the tube of flexible material forming the basic inner tube of the hose is placed over the lining, to be bonded thereto when the bonding step is carried out.

According to an optional feature of the invention the part of the flange over which the lining is splayed out is formed with holes extending from face to face of the flange, and the holes are filled with material which can be bonded to the basic tube and the plies.

The various steps outlined above may be carried out at both ends of the mandrel to form integral flanged ends at both ends of the completed hose.

In another aspect the invention consists of a hose having an integral flanged end comprising a metal flange one face of which forms the end of the hose, an integral perforated

[*Price 33p*]

metal sleeve projecting from the smallest diameter of the other face of the flange, a basic inner tube inside the sleeve extending through and beyond the sleeve and through the flange wtih its end splayed out to overlie a part of the said one face of the flange, a plurality of plies of reinforcing material extending from the flange outside the sleeve and the basic tube and bonded thereto along the length of the hose, a single layer helical winding of metal wire with spaced turns over the said plurality of plies, one end of the wire winding being electrically bonded to the flange, a further plurality of plies of reinforcing material applied over and bonded to the said plurality of plies and the wire winding, an outer covering of flexible material applied over and bonded to the said further plurality of plies, and a tubular lining extending throughout the length of the hose and having its end splayed out to overlie the said one face of the flange to form a fluid seal when the flange is bolted to a connecting member, the lining being bonded to contiguous parts throughout the length of the hose.

The portion of the flange which is overlaid by the splayed out portions of the basic tube and lining may be formed with holes extending from face to face of the flange, and the holes are filled with material which is bonded to the material of the basic tube and plies.

Selected embodiments of the hose according to the invention will now be described with reference to the accompanying drawing in which:—

Figure 1 is a half-section of the end of a hose having an integral metal connecting flange according to the invention;

Figure 2 is a partial sectional view of the wire winding to show how an electrical bonding wire is connected thereto;

Figure 3 shows the flange of the hose end of Figure 1, the flange being formed with holes extending from face to face of the flange which are filled with material which is bonded to the splayed out portion of the basic tube and to the plies of material on the hose; and

Figure 4 is an elevation of the outer face of the flange before assembly, showing the connecting and bonding holes.

Referring to the drawing, the hose according to the invention comprises a metal end flange 11 containing a plurality of bolt holes 12. The outer face 13 of the flange constitutes the end of the hose and is recessed at its inner diameter at 14. The other face 15 of the flange is also recessed at 16. The flange 11 is provided with a sleeve 17 at its smallest diameter and the sleeve 17 extends from the said other face 15 to the flange. The sleeve 17 may be made in one piece with the flange 11 or it may be joined to it by welding, brazing or other permanent fixing means bit it is in any case effectively integral with the flange 11. The sleeve 17 is provided with perforations 18 so that bonding material, in the form of rubber or synthetic rubber or other synthetic plastics material, may be firmly bonded to material both inside and outside the sleeve and to the sleeve itself. The sleeve 17 is provided with a tubular end 19 which is placed over the sleeve and then fixed in position, as by welding or brazing.

The hose is built up on a mandrel. A basic inner hose tube 20, placed on the mandrel, extends through and beyond the sleeve 17, to form the basic tube on which the hose is built, and it also extends through the flange 11, its end being opened out at 21 to fill the recess 14. This basic tube may initially be in the form of a tube or it may be built up of layers, or of a plurality of plies of woven material which may if desired be woven in position before the flange 11 and sleeve 17 are placed over it. A plurality of plies of flexible reinforcing material, such as canvas or other sheet material or, for example, Neoprene coated rayon, are then applied one above the other, commencing in the recess 16 in the flange 11 and extending along the length of the hose. Two of these plies are indicated at 22 and 23. These plies are shown separated in the drawing for the sake of clarity bit it is to be understood that they are contiguous. Moreover, bonding material is applied to the hose as the layers are added and also to fill the perforations in the sleeve 17. These plies extend over the sleeve 17 and the basic tube 20. Additional plies 24 may be applied to make up the thickness of the sleeve 17 in the part of the hose beyond the end of the sleeve.

Over the first plurality of plies of reinforcing material a metal wire winding 25 is applied and consists of a single layer helical winding with spaced turns. It may conveniently consist of galvanized steel wire and one of its purposes is to provide a conducting path through which static electrical charges which develop in the hose may be earthed. Its other purpose is to prevent collapse of the hose if a vacuum should be applied. The end of the wire winding is connected at 26 and 27 to an electrical bonding wire 28. Conveniently the two end turns 29 of the wire winding 25 are close wound and the bonding wire 28 is connected to the turns 29 by a metal bonding clip 30. The bonding wire 28 is then laid over the plies of material and brought up to the flange 11 and electrically bonded to it, for example by brazing. This is not shown in the drawing as it is in itself known practice.

A further ply 31 of material is then placed over the wire winding 25 and a further plurality of plies of flexible reinforcing material indicated at 32, 33 and 34 is then applied over the layer 31. Finally a covering 35, which is thicker than the plies and is made of tough wear resisting flexible material, is

applied over the further plurality of piles.

An inner lining 36 of a suitable material, such as synthetic rubber or other synthetic plastics material, is applied throughout the length of the hose and its end is splayed out at 37 and overlies a part of the said one face 13 of the flange, so that the inner diameter 38 of the hose is uniform throughout its length and the end portion 37 forms a sealing washer to provide a fluid seal with a connecting member (which may be the flanged end of another similar hose) to which the flange 11 is bolted.

The final step is to bond the non-metallic parts to the metallic parts and to bond the non-metallic parts to each other. This will usually be a heat treatment process to "cure" or vulcanize the hose, the exact treatment depending upon the types of materials employed in building the hose.

In a modified form of the method described above a mandrel of smaller diameter is used and the lining 36 is first placed on the mandrel and coated with a bonding agent. The basic tube 20 is placed over the lining and the method as described above is then followed except for the step of adding the lining.

The materials used for the various plies of reinforcement may be in the form of sheet In some cases they may be woven into position, or they may be in the form of tape which is wound helically over the underlying plies or layers of material.

Figures 3 and 4 show a further modification of the hose previously described. In this hose the flange 11 is formed with holes 40 which extend from face to face of that part of the flange 11 which is later covered by the splayed out portion of the basic tube 20 and lining 36. These holes 40 are filled with material or plugs 41 of a kind which will readily bond with the material of the basic tube and the plies of material, such as 22 and 23, which are placed over the sleeve 17, or will readily bond with the bonding material between the opened out end 21 of the basic tube 20 and the adjacent part of the face of the flange 11 and with the bonding material between the opened out end of the ply 17 and the adjacent part of the face of the said flange. With this construction the plugs of material 41 in the holes 40 form direct bonded connections between the overlaid parts of the basic tube 20 and lining 36 on one side of the flange and the reinforcing plies on the other side of the flange.

From the foregoing description it will be evident that the invention provides a very useful form of hose in which it is virtually possible to guarantee that the flange will ver come adrift. Moreover, the flange 11 may be of commendably small diameter in relation to the diameter of the bore of the hose ,and in consequence the end of the hose may be much lighter in weight than conventional hoses Large hoses of the kind for which the invention is particularly suitable are in any case very heavy and the reduction in the weight of the metal and flanges is of considerable benefit.

WHAT WE CLAIM IS:—

1. A method of manufacturing a hose having an integral flanged end comprising the steps of providing a mandrel, placing on the mandrel a tube of flexible material to form the basic inner tube of the hose, placing over the end of the basic tube a metal flange having a bore substantially equal to the outer diameter of the basic tube and having an integral perforated metal sleeve projecting from its bore towards the body of the hose, applying over the basic tube and the sleeve a plurality of plies of reinforcing material, applying a single layer helical winding of metal wire over the said plurality of plies, electrically bonding the adjacent end of the wire winding to the flange, applying a further pluraity of plies of reinforcing material over the wire winding, applying an outer covering over the further plurality of plies, removing the hose from the mandrel, placing inside the basic tube and flange a lining of flexible material, splaying out the end of the basic tube and lining to overlie a part of the outer face of the flange and form a fluid seal with connecting member, and bonding the flange, basic tube, plies, wire winding, outer covering and lining to each other.

2. A modification of the method claimed in claim 1 in which flexible material forming the lining is first placed on the mandrel, and the tube of flexible material forming the basic inner tube of the hose is placed over the lining, to be bonded thereto when the bonding step is carried out.

3. A method as claimed in claim 1 or 2 in which the part of the flange over which the lining is splayed out is formed with holes extending from face to face of the flange, and the holes are filled with material which can be bonded to the basic tube and plies.

4. A hose having an integral flanged end comprising a metal flange one face of which forms the end of the hose, an integral perforated metal sleeve projecting from the smallest diameter of the other face of the flange, a basic inner tube inside the sleeve extending through and beyond the sleeve and through the flange with its end splayed out to overlie a part of the said one face of the flange, a plurality of plies of reinforcing material extending from the flange outside the sleeve and the basic tube and bonded thereto along the length of the hose, a single layer helical winding of metal wire with spaced turns over the said plurality of plies, one end of the wire winding being electrically bonded to the flange, a further plurality of plies of reinforcing material applied over and bonded

to the said plurality of plies and the wire winding, an outer covering of flexible material applied over and bonded to the said further plurality of plies, and a tubular lining extending throughout the length of the hose and having its end splayed out to overlie the said one face of the flange to form a fluid seal when the flange is bolted to a connecting member, the lining being bonded to contiguous parts throughout the length of the hose.

5. A hose as claimed in claim 4 in which the portion of the flange which is overlaid by the splayed out portion of the basic tube and lining is formed with holes extending from face to face of the flange, and the holes are filled with material which is bonded to the material of the basic tube and plies.

6. A method of manufacturing a hose, substantially as herein described, with reference to and as illustrated in the accompanying drawings.

7. A hose having an integral flanged end, constructed and arranged substantially as herein described, with reference to and as illustrated in the accompanying drawings.

8. A hose having an integral flanged end at each end, the integral flanged ends being formed by a method as claimed in any one of claims 1 to 3 or 6, or being in accordance with any one of claims 4, 5 or 7.

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1393182 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

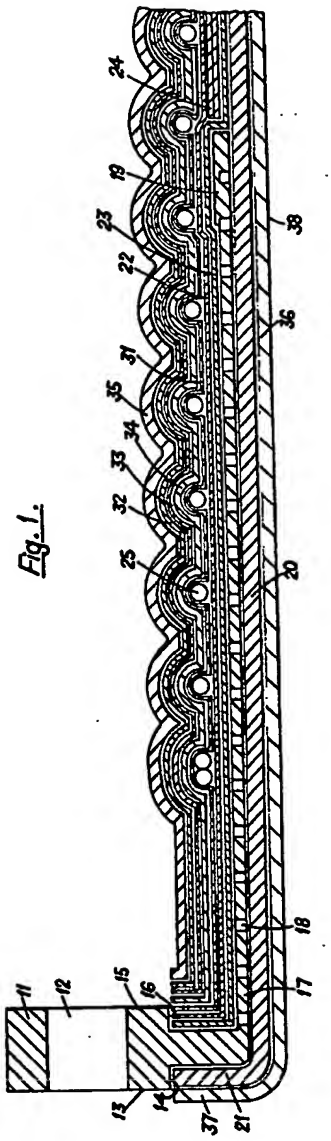

Fig. 1.

1393182 COMPLETE SPECIFICATION

2 SHEETS This drawing is a reproduction of the Original on a reduced scale

Sheet 2

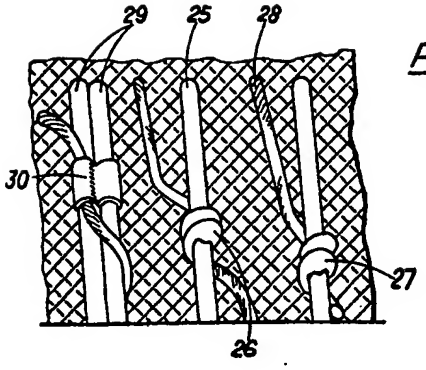

Fig. 2.

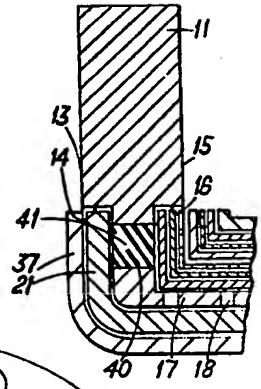

Fig. 3.

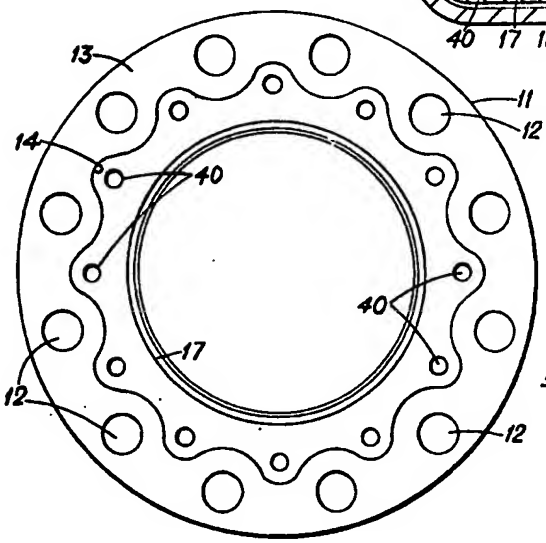

Fig. 4.